GeAS
e-ISSN:2316-9834
Revista de Gestão Ambiental e Sustentabilidade
Journal of Environmental Management & Sustainability

Received: 28 Nov. 2023 - **Approved:** 30 Aug. 2024
Responsible Editor: Andreza Portella Ribeiro
Evaluation Process: Double Blind Review
https://doi.org/10.5585/2025.25553
Original Articles

Analysis of intention to purchase environmentally friendly packaging in the city of Ribeirão Preto, Brazil

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Authors' notes

The authors have no conflicts of interest to declare.
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Acknowledgements: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) and the São Paulo Research Foundation - FAPESP (Process Number 2019/06329-0) for their financial support.

Cite as - American Psychological Association (APA)

Aguilar, G. J., Oliveira, A. M., Tapia-Blácido, D. R. (2025). Analysis of intention to purchase environmentally friendly packaging in the city of Ribeirão Preto, Brazil. *Revista de Gestão Ambiental e Sustentabilidade - GeAS, 14*(1), 1-34, e25553. https://doi.org/10.5585/2025.25553

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Abstract

Objective: To evaluate consumers' intention to purchase biopackaging in the city of Ribeirão Preto, State of São Paulo, Brazil.

Methodology: Structural equation modeling was assessed by applying a questionnaire to citizens in Ribeirão Preto. The constructs Personal Norms, Attitude, Environmental Concern, and Willingness to Pay were correlated with the construct Purchase Intention, and the structural model was analyzed.

Originality/Relevance: This study stands out for its originality in investigating how certain factors affect consumers' intention to purchase environmentally friendly packaging in Ribeirão Preto as a specific case study in Brazil. Given that few studies have addressed such topic in this country, the study aims to contribute to the research field significantly.

Results: All the constructs positively influenced the construct Purchase Intention, but Environmental Concern and Personal Norms were the strongest predictors of this intention (standardized regression coefficients of 0.821 and 0.818, respectively; $p \leq 0.01$).

Social/Management Contributions: Broader ecological awareness is promoted within the society when companies are encouraged to develop new biodegradable and environmentally friendly packaging that meets consumers' needs and considers environmental demands. In the management context, emphasizing how the constructs positively influence purchase intention highlights specific areas on which organizations can focus when they develop and market sustainable packaging. It is hoped that the study will encourage companies to embrace sustainable development and to align their products with the consumers' growing expectations about sustainability, green consumption, and social and ecological responsibility.

Keywords: purchase intention, sustainable, ecological, packaging, Brazil

Resumo

Análise da intenção de compra de embalagens ecológicas e sustentáveis na cidade de Ribeirão Preto, Brasil

Objetivo: Avaliar a intenção de compra de embalagens biodegradáveis na cidade de Ribeirão Preto, Brasil.

Metodologia: A modelagem de equações estruturais foi realizada por meio de um questionário aplicado na cidade de Ribeirão Preto, Brasil. Os construtos de Normas Pessoais, Atitude,

Preocupação Ambiental e Disposição para Pagar foram correlacionados com a Intenção de Compra, e o modelo estrutural foi analisado.

Originalidade/Relevância: Este estudo destaca-se pela originalidade ao investigar a intenção de compra de embalagens biodegradáveis na cidade de Ribeirão Preto, Brasil, pela primeira vez. O estudo busca fornecer uma contribuição significativa para o campo de pesquisa, uma vez que há poucos estudos abordando o tema no país.

Resultados: Todos os construtos influenciaram positivamente a Intenção de Compra. A Preocupação Ambiental e as Normas Pessoais foram os preditores mais fortes (coeficientes de regressão padronizados de 0,821 e 0,818, respectivamente, $p \leq 0,01$).

Contribuições Sociais/Gerenciais: Socialmente, ao incentivar as empresas a desenvolverem novas embalagens biodegradáveis que atendam às necessidades dos consumidores, considerando simultaneamente as demandas ambientais, promove-se uma conscientização ecológica mais ampla na sociedade. No contexto da gestão, a ênfase na influência positiva dos construtos na intenção de compra destaca áreas específicas nas quais as organizações podem se concentrar ao desenvolver e comercializar embalagens sustentáveis. Espera-se que o estudo encoraje as empresas como agentes de mudança positiva, alinhando-se às crescentes expectativas dos consumidores em relação à responsabilidade social e ecológica.

Palavras-chave: intenção de compra, sustentável, ecológico, embalagem, Brasil

Resumen

Análisis de la intención de compra de envases ecológicos y sostenibles en la ciudad de Ribeirão Preto, Brasil

Objetivo: El objetivo es evaluar la intención de compra de envases biodegradables en la ciudad de Ribeirão Preto, Brasil.

Metodología: Se evaluó la modelización de ecuaciones estructurales mediante un cuestionario aplicado en la ciudad de Ribeirão Preto, Brasil. Los constructos de Normas Personales, Actitud, Preocupación Ambiental y Disposición a Pagar se correlacionaron con la Intención de Compra, y se analizó el modelo estructural.

Originalidad/Relevancia: Este estudio se destaca por su originalidad al investigar la intención de compra de envases biodegradables en la ciudad de Ribeirão Preto, Brasil, por primera vez. El estudio busca proporcionar una contribución significativa al campo de investigación, ya que hay pocos estudios abordando el tema en el país.

Resultados: Todos los constructos influyeron positivamente en la Intención de Compra. La Preocupación Ambiental y las Normas Personales fueron los predictores más fuertes (coeficientes de regresión estandarizados de 0,821 y 0,818, respectivamente, p ≤ 0,01).
Contribuciones Sociales/Gerenciales: Socialmente, al incentivar a las empresas a desarrollar nuevos envases biodegradables que satisfagan las necesidades de los consumidores, considerando simultáneamente las demandas ambientales, se promueve una conciencia ecológica más amplia en la sociedad. En el contexto de la gestión, el énfasis en la influencia positiva de los constructos en la intención de compra destaca áreas específicas en las que las organizaciones pueden centrarse al desarrollar y comercializar envases sostenibles. Se espera que el estudio anime a las empresas como agentes de cambio positivo, alineándose con las crecientes expectativas de los consumidores en relación con la responsabilidad social y ecológica.

Palabras clave: intención de compra, sostenible, ecológico, envase, Brasil

Analysis of intention to purchase environmentally friendly packaging in the city of Ribeirão Preto, Brazil

The United Nations supports guidelines and recommendations that aim to protect the nature, environment, and climate. Aligned with this commitment, the 17 Sustainable Development Goals (SDGs) represent a universal agenda embraced by United Nations member states to confront urgent environmental, social, and economic challenges while advancing toward a more equitable and sustainable future for all. Among these goals, SDG 12 stands as a pillar to support sustainable consumption and production patterns. The SDG targets 12.5 and 12.6 aim to "By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse" and "Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle". In this context, advocating in favor of ecological and sustainable packaging emerges as a meaningful way to achieve SDG 12, especially targets 12.5 and 12.6 (United Nations, 2023).

Highlighting the damages caused by disposable plastic utensils to the environment is crucial, as it encompasses everything from river obstruction and recurring urban floods to the accumulation of waste that jeopardizes marine ecosystems (Martinho et al., 2017; Muposhi et al., 2022). Moreover, the prolonged decomposition time of these materials not only contributes to pollution but also increases the risk of ingestion by animals, resulting in harm to species and

affecting the entire food chain, including humans, who are at risk of ingesting microplastics through food (Jonsson et al., 2021; Martinho et al., 2017). To illustrate this issue, a study conducted in the United States suggested that, in 2016, approximately 90% of seafood imported from areas with a history of plastic pollution contained residues of this material (Lusher et al., 2017). Despite the lack of in-depth studies, the ingestion of microplastics can trigger aggressive tissue inflammations, damage intestinal flora, cause cell necrosis, and compromise people's immune systems (Smith et al., 2018; Wright & Kelly, 2017).

Because petroleum-based plastics impact the environment, environmentally friendly packaging has attracted consumers' attention (Álvarez-González et al., 2023; Santos et al., 2021). An alternative to reduce the impact of such plastics is to develop sustainable and environmentally friendly products (Cammarelle et al., 2021; Macht et al., 2023; Sigit et al., 2018) that can be produced from polymers including starch, protein, gelatin, chitin, and cellulose, among others, which can be isolated from plants, animals, or agroindustrial residues. Using agroindustrial residues as a source of biopolymers can reduce the cost of producing environmentally friendly packaging (Aguilar & Tapia-Blácido, 2023; Tapia-Blácido et al., 2022).

Environmentally friendly or ecological packaging can be rapidly degraded by microorganisms that are naturally present in the Environment, but packaging biodegradation must not interfere in the fauna or flora of the ecosystem where they are discarded. Carbon dioxide, methane, and water are the main products of biodegradation reactions. The proportion at which these compounds are generated depends on the environmental conditions in which biodegradation occurs (Briassoulis & Dejean, 2010; Shaikh et al., 2021).

On the other hand, people's behavior regarding packaging use plays a central role in the production chain. Purchasing, using, and correctly disposing of packaging largely rely on consumers' habits and affects the entire system. In this scenario, companies must analyze not only consumers that are just concerned about choosing the product they want to buy, but also citizens that are worried about sorting out and correctly disposing of packaging (Allison et al., 2021). Understanding people's behavior toward ecological and sustainable packaging is essential to verify whether such products are accepted. Consumers' acceptance of these products encourages their development and expands their industrial production and use while mitigating the environmental impact of plastic packaging (Bojanowska & Sulimierska, 2023; Lan et al., 2023; Oliver et al., 2023; Ruggerio, 2021).

Citizens have become increasingly aware of how they impact the planet and how their choices and actions may negatively affect the environment. In addition, sustainable consumption habits have been increasingly adopted, causing consumers to purchase ecological products and

even to be willing to pay a little more for eco-friendly products. As a result, companies from different sectors are planning to implement more sustainable operations and to produce more sustainable products by developing and applying the best strategies to satisfy more environmentally aware consumers (Han et al., 2019; Salsabila & Salehudin, 2023; Song et al., 2023; Wang et al., 2023).

Few studies have assessed consumers' intention to purchase environmentally friendly packaging in Brazil. Therefore, this study aims to survey how Brazilians living in Ribeirão Preto, state of São Paulo, Brazil perceive ecological packaging and whether they intend to purchase this type of packaging. Understanding consumers' intentions to opt for ecological and sustainable packaging allows researchers and businesses to gauge the potential environmental impact of such choices. This information is crucial for assessing whether sustainable packaging solutions are effective in mitigating ecological concerns such as plastic pollution and resource depletion. Examining consumer intentions provides valuable insights into behavioral patterns and preferences. This understanding is essential for businesses that aim to align their products with the values and expectations of environmentally conscious consumers. Besides, it enables companies to tailor their marketing strategies and product development efforts to meet consumers' demands more effectively. The aim of the study was as to contribute to encouraging more companies to develop sustainable packaging after consumers' behavior and perspectives are considered. Also, it could help companies to adopt increasingly sustainable production habits, so that the SDG 12 goals can be achieved. Finally, the study may inspire other researchers to conduct similar studies in different locations, further promoting sustainable consumption habits worldwide.

Model Formulation

The model proposed by Prakash and Pathak (2017), which analyzes the relationship between the construct Purchase Intention and the constructs Attitude, Environmental Concern, Personal Norms, and Willingness to Pay, was evaluated (Prakash & Pathak, 2017). This model is based on the Theory of Reasoned Action (TRA), which focuses on building the relationship of certain constructs with certain individual behaviors. The relationship can be negative or positive when there is significance, but the constructs Attitude, Environmental Concern, Personal Norms, and Willingness to Pay are not related. This theory has been applied in areas such as health, psychology, economics, and advertising, and it has been emphasized in sustainable consumption studies. On the basis of this theory, theoretical models with new constructs have also been proposed and adapted (Ajzen & Fishbein, 1977; Dillard & Pfau, 2002; Han, 2021; Prakash & Pathak, 2017).

Attitude

Attitude can be defined as a certain way of thinking, feeling, and reacting to the various events that surround the individual, whether the events are concrete or symbolic. Moreover, the Attitude intent may be consummated or not, depending on certain circumstances (Alves, 2008). When Attitude is included to determine intention to purchase bioplastic or biopackaging, a significantly positive influence is often observed (ElHaffar et al., 2020). Therefore, the following hypotheses were formulated:

H_{0a}

The participants' intention to purchase sustainable and eco-friendly packaging products is not significantly affected by Attitude.

H_{1a}

The participants' intention to purchase sustainable and eco-friendly packaging is significantly affected by Attitude.

Environmental Concern

Environmental Concern is related to knowledge of the problems generated by environmental pollution by synthetic plastics and how much the individual is concerned about solving them. It is not enough for citizens to be aware of their environmental impact on the planet—they must also be willing to act and to take measures to reduce the environmental impact caused by their consumption habits. Environmental Concern directly affects the individual's sustainable consumption habits (Beck & Pereira, 2012; Gifford & Nilsson, 2014). Therefore, the following hypotheses regarding Environmental Concern and Purchase Intention were formulated:

H_{0b}

The participants' intention to purchase sustainable and eco-friendly packaging is not significantly affected by Environmental Concern.

H_{1b}

The participants' intention to purchase sustainable and eco-friendly packaging is significantly affected by Environmental Concern.

Personal Norms

Personal Norms can be defined as a set of rules or standards for the individual's own behavior. These norms can be summarized as feelings of moral obligations to act in good conscience. Personal Norms predict pro-environmental behavior and strongly motivate pro-environmental intention (de Groot et al., 2021; Schultz et al., 2016). Besides that, personal norms are an individual's own internalized norm of a given situation (Gifford & Nilsson, 2014). Therefore, Personal Norms can affect intention to purchase, which has led us to formulate the following hypotheses:

H_{0c}

The participants' intention to purchase sustainable and eco-friendly packaging is not significantly affected by Personal Norms.

H_{1c}

The participants' intention to purchase sustainable and eco-friendly packaging is significantly affected by Personal Norms.

Willingness to Pay

Product value is a very important variable that can result in the act of purchase (Han, 2021; Laroche et al., 2001). Although new efforts have been directed toward developing cheaper environmentally friendly packaging, plastics originating from unsustainable petroleum sources are usually cheaper (Aguilar & Tapia-Blácido, 2023; Tapia-Blácido et al., 2022).

Ecological packaging with an acceptable cost can increase Purchase Intention, contributing to environmental sustainability even though consumers with a developed environmental conscience and more concerned with the conservation of the planet may not mind

paying more for ecological and sustainable packaging (Cronin et al., 2011; Laroche et al., 2001). Therefore, the following hypotheses were formulated:

H_{0d}

The participants' intention to purchase sustainable and eco-friendly packaging is not significantly affected by Willingness to Pay.

H_{1d}

The participants' intention to purchase sustainable and eco-friendly packaging with higher cost is significantly affected by Willingness to Pay.

Materials & Methods

This study was submitted to the Research Ethics Committee (REC) of the Faculty of Philosophy, Sciences and Letters of Ribeirão Preto, University of São Paulo and was approved in August 2022 (Certificate of Ethical Appreciation Presentation: 59245222.5.0000.5407). The questionnaire was applied in the city of Ribeirão Preto, State of São Paulo, Brazil. According to the Brazilian Institute of Geography and Statistics (IBGE, 2021), Ribeirão Preto has 720,116 inhabitants, a demographic density of 928.92 inhabitants/km², and a GDP per capita of 49,476.86 reais. Apart from being a tourist and business hub, the city has several colleges such as the University of São Paulo and job vacancies that attract young people from different regions of the country. For all these reasons, Ribeirão Preto was ideal for carrying out the study, which it could be replicated by researchers in other regions in Brazil and other countries. The interviews were conducted from October 2022 to January 2023 in randomly selected areas of the city visited by the general population, e.g., ecological parks, the central region, and commercial or educational centers, to minimize the risk of bias and distortions that could interfere in the responses. In addition, the researchers that collected the data had been trained for method standardization and instrument application.

The study on intention to purchase ecological and sustainable packaging was based on a cross-sectional design and carried out by using psychometric instruments, to evaluate the consumption profile and consumers' attitudes toward ecological and biodegradable packaging. The questionnaire was given to the participant after an informed consent form was signed, and

the researcher was available to clarify any doubts. These steps were performed to ensure participants' comfort and the confidentiality of their responses.

Nunnally (1975) suggested considering at least a sampling of 10 cases per parameter/item, Boomsma & Hoogland (2001) and Wolf et al. (2013) suggested at least 10 samplings of each model item, so a minimum of 160 valid responses were expected for the statistical analysis procedure. Additionally, the number of participants was based on reports about this topic, e.g., 384 (Moshood et al., 2022), 292 (Confente et al., 2020), 254 (Kirana, 2022), and 120 (Hafiz & Permana, 2021). Therefore, 400 questionnaires were initially distributed, and only valid questionnaires were later selected.

The sociodemographic variables were gender (male or female), age (in years), educational status (incomplete Elementary School, complete Elementary School, complete High School, university degree, or Postgraduate degree), family income (up to 2, between 3 and 4, between 5 and 7, at least 8 minimum wages), birthplace, and occupation (student, employee, unemployed, retired, or other).

The questionnaire had already been validated in India (Prakash & Pathak, 2017), who evaluated intention to purchase ecological products among consumers in that country. The questionnaire consists of items adapted by Prakash and Pathak (2017) and related to Environmental Concern (Koenig-Lewis et al., 2014), Attitude (Han & Yoon, 2015), Personal Norms from (Khare, 2015), Willingness to Pay (Jang et al., 2011), and Purchase Intention (Wee et al., 2014).

Table 1 contains a description of the questionnaire, which was translated into Portuguese by a Brazilian teacher of English and revised by three Brazilians who have lived in Brazil for over 20 years. This measure was adopted to avoid distortions in the translation and in participants' understanding of them.

Table 1

Complete applied questionnaire describing the constructs and their respective items

Construct	Code	Item
Attitude	AT1	If I had a choice, I would buy particular products that use biodegradable plastic in packaging.
	AT2	I would be willing to buy products that picked up and recycled for other use.
	AT3	I would buy products from a less known company if they were biodegradable.
Environmental Concern	EN1	I make a special effort to buy paper and plastic products that are made of recycled materials.
	EN2	I have switched products for ecological reasons.
	EN3	When I have a choice between two equal products. I purchase the one less harmful to other people and the environment.
	EN4*	Mankind was created to rule over the rest of nature.
Personal Norms	PE1	I feel an obligation to save environment where possible.
	PE2	I should do what I can to conserve natural resources.
	PE3	I feel a strong personal obligation to use eco-friendly packaged product.
Willingness to Pay	WI1	It is acceptable for me to pay more money for groceries that are packaged in an environmentally friendly way.
	WI2	I feel proud to have environmental friendly packaged products in my house though they are more costly than conventionally packaged products.
	WI3	I would be willing to spend more money in order to buy less environmentally harmful products.
Purchase Intention	PU1	I would buy eco-friendly packaged products in the near future.
	PU2	I plan to buy eco-friendly packaged products in regular basics.
	PU3	I intend to buy eco-friendly packaged products because they are more environmentally friendly.

Note. *Item was reverse scored during statistical analysis. Source: Prepared by the authors.

To assess attitude scales, Likert (1932) developed a methodology that is originally based on a scale that ranges from strongly approve (1) to strongly disapprove (5) for several questions. The method is extremely accepted and validated by the scientific academy, and the literature contains numerous studies based on this method (Boone & Boone, 2012). Thus, the response section of the questionnaire consisted of a Likert scale spanning from 1 to 5 points (Strongly Disagree – 1, Disagree – 2, Neither Agree nor Disagree – 3, Agree – 4, and Strongly Agree – 5).

For statistical analysis, the programs Jamovi software version 2.3.2021, IBM SPSS Statics, and IBM SPSS Amos 26 Graphics were used. After the questionnaires were applied, they were counted and stored in table format. Incomplete questionnaires were considered invalid, so they were not included in the results.

In the beginning, the data were descriptively analyzed. The frequency of the dependent variables was counted and expressed in a Likert chart. Subsequently, item-total correlation and Cronbach's α and McDonald's ω analyses were conducted for each of the constructs. If necessary, variables with little significance were excluded from structural equation modeling (SEM). A structural model was proposed and validated with structural SEM. The factors Loading, Composite Reliability, Cronbach's α, McDonald's ω, and Average Variance Extracted (AVE) were calculated and expressed for the constructs. Implicit correlations were obtained, and the HTMT ratio (heterotrait-monotrait ratio of correlations) was used to determine discriminant validity. Subsequently, the Confirmatory Factor Analysis (CFA) structural model fit was evaluated according to chi-square ($\chi 2$), df, $\chi 2/df$, p-value, Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Incremental Fit Index (IFI), Tucker-Lewis Index (TLI), Normed Fit index (NFI), and Root Mean Square Error (RMSEA).

Results

The results were divided into subdivisions encompassing the characteristics of the study participants, as well as the analyses conducted and the stages of the SEM performed. This structure was adopted with the aim of providing a better understanding of the assessments carried out.

Participants' sociodemographic distribution

The participants' sociodemographic distribution can be seen in Table 2. It was obtained 325 valid questionnaires after removing invalid questionnaires (n = 75; 18.8%). Most of the participants were female (n = 187; 57.54%). Regarding age, analysis of the questionnaires showed an average age of 26 ± 7 years. One of the campuses of the University of São Paulo is in Ribeirão Preto, a city that has attracted young people from all over the country. A younger group of participants can be a great population to study because they are the future consumers.

Table 2

Participants' sociodemographic distribution

Sociodemographic data (n)*	Response	Result (n)
Gender (325)	Male	42.46% (138)
	Female	57.54% (187)
Average age (309)	25.8 ± 7.3 years	
Family income (302)**	Up to 2 minimum wages	35.77% (108)
	Between 3 and 4 minimum wages	28.48% (86)
	Between 5 and 7 minimum wages	19.87% (60)
	At least 8 minimum wages	15.89% (48)
Educational status (324)	Incomplete Elementary School	0.62% (2)
	Complete Primary Education	1.24% (4)
	Complete High School	58.65% (190)
	University degree	24.38% (79)
	Postgraduate degree	15.12% (49)
Occupation (n = 323)	Student	59.09% (208)
	Employee	27.56% (97)
	Unemployed	2.27% (8)
	Retiree	0
	Other	2.84% (10)

Note. * Some participants did not answer about personal data; therefore, the n is different for some sociodemographic variables. However, all the 325 participants adequately responded the purchase intention questionnaire for ecological products.
** A minimum wage is equal to 1,212.00 reais or 244.20 dollars considering the exchange rate at the time the study was carried out.
Source: Prepared by the authors.

Regarding family income, 302 responses were valid, as shown in Table 3. Most participants had a family income of up to 2 minimum wages (n = 108; 35.77%), followed by between 3 and 4 minimum wages (n = 86; 28.48%), between 5 and 7 minimum wages (n = 60; 19.87%), and at least 8 minimum wages (n = 48; 15.89%). A lower family income can represent a challenge when intention to purchase bioplastic is analyzed. If the price difference between ecological packaging and conventional plastic is great, people with lower incomes tend to choose the packaging with the lowest price. Therefore, for environmentally friendly packaging to be accessible and viable for the entire Brazilian population, the purchase price is fundamental.

Most participants (n = 190; 58.65%) finished high school, followed by participants with university degree (n = 79; 24.38%), postgraduate degree (n = 49; 15.12%), complete elementary education (n = 4; 1.24%), and incomplete elementary school (n = 2; 0.62%).

Concerning the distribution of the participants' occupation, most were students (n = 208; 59.09%), followed by employees (n = 97; 27.56%), other (n = 10; 2.84%), and unemployed (n = 8; 2.27%).

The distribution of birthplaces is shown in Table 3. The participants were born in various regions of Brazil, in 18 different states. Most participants were from the State of São Paulo (n = 253). About this state, most participants were born in Ribeirão Preto (n = 75), as expected, followed by the state capital city, São Paulo (n = 35). Many participants were from the state of Minas Gerais (n = 25). The participants' birthplaces tended to be cities and states closer to Ribeirão Preto; that is, participants tended to be from southeastern Brazil and cities located in the northeastern part of the State of São Paulo.

Table 3

Participants' birthplace distribution

	Birthplace (n = 321)
State* (n)	**City (n)**
AL (1)	Maceió (1)
BA (7)	Acajutiba (1), Guanambi (2), Riacho de Santana (1), Salvador (2), São Felix (1)
CE (1)	Juazeiro do Norte (1)
DF (1)	Brasília (1)
GO (8)	Anápolis (1), Ceres (1), Goiânia (4), Pirajuba (1), Quirinópolis (1)
MA (4)	Açailândia (1), Barra do Corda (1), Caxias (1), São Luís (1)
MG (25)	Alfenas (1), Almenara (1), Araxá (1), Belo Horizonte (3), Boa Esperança (2), Coronel Fabriciano (1), Curvelo (1), Governador Valadares (1), Guaxupé (1), Ilicínea (1), Itacarambi (1), Itamogi (1), Ituiutaba (1), Iturama (1), Montes Claros (1), Passos (2), Patrocínio (1), Pouso Alegre (1), São Sebastião do Paraíso (1), Taiobeiras (1), Uberaba (1)
MS (2)	Campo Grande (1), Coxim (1)
MT (2)	Cuiabá (1), Rondonópolis (1)
PA (3)	Bragança (1), Muaná (1), Oriximiná (1)
PB (2)	João Pessoa (2)
PE (3)	Carpina (1), Moreno (1), Recife (1)
PI (1)	Floriano (1)
PR (4)	Bom Sucesso (1), Curitiba (1), Maringá (1), Tapejara (1)
RJ (1)	Rio de Janeiro (1)
RS (2)	Santo Ângelo (1), Sapiranga (1)
SE (1)	Aracaju (1)
SP (253)	Aguaí (1), Altinópolis (1), Araçatuba (3), Araraquara (2), Araras (1), Barretos (2), Barrinha (1), Barueri (1), Batatais (5), Bauru (3), Bebedouro (2), Botucatu (1), Brodowski (1), Campinas (5), Caxias (1), Fernandópolis (5), Franca (5), Guaíra (1), Guarulhos (4), Ituverava (1), Jabaquara (1), Jaboticabal (4), Jundiaí (4), Leme (1), Lençóis Paulista (1), Limeira (3), Lins (1), Mantena (1), Marília (2), Mococa (1), Mogi Mirim (1), Mogi-Guaçu (1), Monte Alto (3), Orlândia (3), Osasco (1), Paulínia (4), Piracicaba (5), Pontal (2), Porto Ferreira (1), Presidente Epitácio (1), Quatá (1), Ribeirão Preto (75), Rio Claro (1), Rio das Pedras (1), Salto (1), Santa Bárbara d'Oeste (2), Santa Rita do Passa Quatro (9), Santa Rosa do Viterbo (1), Santo André (4), Santos (2), São Bernardo do Campo (1), São Caetano do Sul (2), São Carlos (4), São João da Boa Vista (1), São Joaquim da Barra (3), São José do Rio Preto (4), São Paulo (35), São Roque (1), Sertãozinho (11), Tabatinga (2), Taubaté (2), Tupã (1), Uchoa (1), Votuporanga (1)

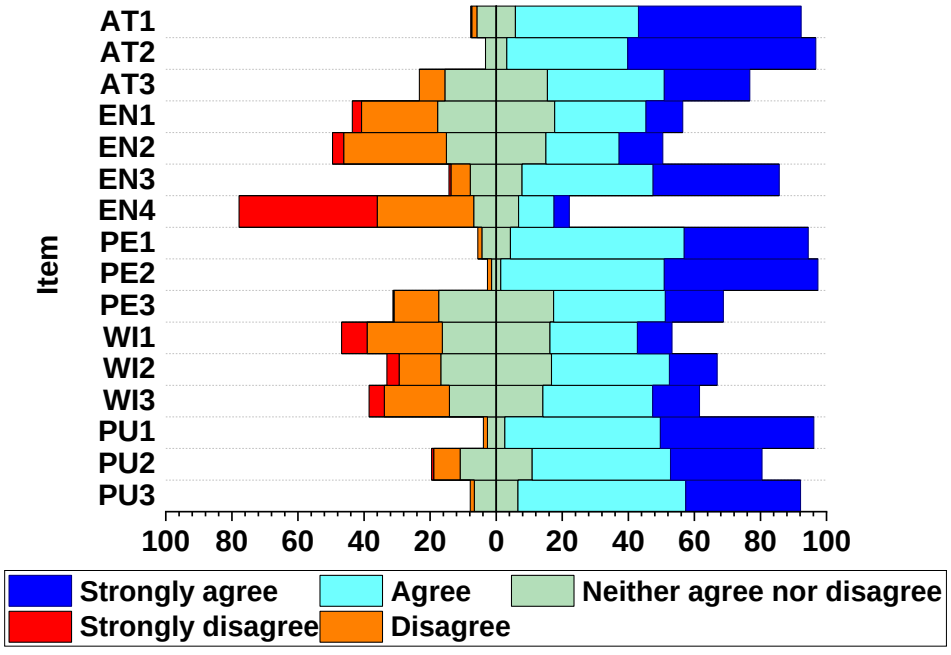
Note. *AL: Alagoas, BA: Bahia, CE: Ceará, DF: Distrito Federal, GO: Goiás, MA: Maranhão, MG: Minas Gerais, MS: Mato Grosso do Sul, MT: Mato Grosso, PA: Pará, PB: Paraíba, PE: Pernambuco, PI: Piauí, PR: Paraná, RJ: Rio de Janeiro, RS: Rio Grande do Sul, SE: Sergipe, SP: São Paulo.
Source: Prepared by the authors.

Frequency of the dependent variables

Figure 1 shows the distribution of the responses to the questionnaire items about intention to purchase environmentally friendly packaging. Attitude, Personal Norms, and Purchase Intention had a greater number of strongly agree and agree responses, while Environmental Concern and Willingness to Pay involved more neutral, but slightly positive responses. Question EN4 of the construct Environmental Concern was an exception, with greater amounts of strongly disagree and disagree responses; however, the question had a negative correlation that was applied in subsequent statistical analyses.

Figure 1

Distribution of responses to the questionnaire items according to the Likert scale



Source: Prepared by the authors.

Reliability statistics of the questionnaire items

Table 4 shows the reliability statistics of the questionnaire items. Question EN4 was the only observable variable that improved Cronbach's α (from 0.591 to 0.763) and McDonald's ω (from 0.675 to 0.768) after being removed from the construct, thus improving the internal consistency of the construct Environmental Concern. Furthermore, the item-total correlation was low (0.0616). During statistical analyses, the tests were carried out by including EN4, which gave lower reliability and validity with a model that provided less adjustment (result not shown). Therefore, the EN4 was removed from further analyses, to obtain better reliability and validity.

Table 4

Reliability statistics of the questionnaire items: Mean, standard deviation, item-total correlation, and Cronbach's α and Mcdonald's ω obtained if the item was eliminated

Item Reliability Statistics					
Construct/Item	**Mean**	**Standard deviation**	**Item-total correlation**	**If the item was eliminated**	
				Cronbach's α	**Mcdonald's ω**
Attitude	**4.21**	**0.614**	**NA**	**0.700***	**0.721***
AT1	4.33	0.766	0.549	0.569	0.600
AT2	4.51	0.617	0.553	0.598	0.605
AT3	3.79	0.916	0.495	0.671	0.682
Environmental Concern	**3.58**	**0.705**	**NA**	**0.591***	**0.675***
EN1	3.21	1.017	0.5096	0.412	0.513
EN2	3.10	1.095	0.5359	0.378	0.581
EN3	4.09	0.907	0.4900	0.444	0.619
EN4	3.94	1.173	0.0616	0.763	0.768
Personal Norms	**4.08**	**0.595**	**NA**	**0.702***	**0.739***
PE1	4.26	0.665	0.580	0.552	0.588
PE2	4.41	0.610	0.565	0.586	0.610
PE3	3.55	0.937	0.483	0.728	0.730
Willingness to Pay	**3.28**	**0.923**	**NA**	**0.840***	**0.846***
WI1	3.08	1.098	0.698	0.784	0.785
WI2	3.45	0.998	0.635	0.840	0.840
WI3	3.32	1.083	0.785	0.695	0.697
Purchase Intention	**4.15**	**0.641**	**NA**	**0.783***	**0.802***
WI1	4.39	0.646	0.596	0.745	0.762
WI2	3.88	0.925	0.624	0.744	0.746
WI3	4.19	0.702	0.699	0.633	0.661

Note. NA: not applicable, *: Cronbach's α and McDonald's ω for the constructs, therefore disregard "If the item is eliminated".
Source: Prepared by the authors.

CFA

Table 5 shows the values of the factors Loading, Composite Reliability, Cronbach's α, McDonald's ω, and AVE for Attitude, Environmental Concern, Personal Norms, Willingness to Pay, and Purchase Intention. As recommended by Bagozzi and Yi (1988), the values of the factor Loading evaluated in the model lay in the recommended range, between 0.5 and up to 0.95, and the values of the factor Composite Reliability were appropriate (recommended value ≥ 0.6).

Whereas Cronbach's α and McDonald's ω values alone may not suffice to indicate reliability and internal consistency, they serve as important statistical measures. When these values are considered alongside other relevant statistical indicators, they contribute to confirming internal consistency. Notably, obtaining acceptable and satisfactory values for both Cronbach's α and McDonald's ω, which should be above 0.7, further supports that the measurements are reliable. All the Cronbach's α and McDonald's ω values obtained here agreed with the established value, so comprehensive analysis of the different statistical measures strengthens data internal consistency (Graham, 2006; Lucke, 2005; Taber, 2018).

The AVE values recommended by Bagozzi and Yi (1988) are equal to or above 0.5. Analysis of Environmental Concern, Willingness to Pay, and Purchase Intention evidenced that the AVE values were above the recommended threshold. However, for Attitude and Personal Norms, the AVE values were slightly below the recommended threshold when the results were considered to three significant digits (0.000). When the AVE values were rounded to one significant digit (0.0), all the constructs fell within the defined limit (0.5). Therefore, by considering the results of other applied statistical analyses, it became evident that the evaluation criteria were met, which allowed us to proceed with CFA for the proposed study (Lam, 2012).

Table 5

Factors Loading, Composite Reliability, Cronbach's α, McDonald's ω, and AVE for Attitude, Environmental Concern, Personal Norms, Willingness to Pay, and Purchase Intention

Construct	Item	Loading	Composite Reliability	Cronbach's α	McDonald's ω	AVE
Attitude	AT1	0.718	0.720	0.700	0.721	0.461
	AT2	0.658				
	AT3	0.66				
Environmental Concern	EN1	0.762	0.769	0.763	0.768	0.526
	EN2	0.735				
	EN3	0.676				
Personal Norms	PE1	0.672	0.726	0.702	0.739	0.469
	PE2	0.662				
	PE3	0.72				
Willingness to Pay	WI1	0.808	0.847	0.840	0.846	0.650
	WI2	0.709				
	WI3	0.892				
Purchase Intention	WI1	0.677	0.802	0.783	0.802	0.577
	WI2	0.719				
	WI3	0.869				

Source: Prepared by the authors.

In the next step, the discriminant validity was evaluated. The HTMT ratio of correlations is an approach that assesses discriminant validity in variance-based SEM. The HTMT ratio is obtained from the Heterotrait Correlation and Monotrait Correlations data. If the HTMT value is below 0.90, discriminant validity between two reflective constructs is established (Henseler et al., 2015). As observed in Table 6, the HTMT value was less than 0.90 for all the correlations between the constructs, confirming discriminant validity between all the proposed correlations.

Table 6

HTMT ratio, Monotrait Correlations, and Heterotrait Correlation for the constructs

	Attitude	Environmental Concern	Personal Norms	Willingness to Pay	Purchase Intention
Attitude	**0.471**	0.352**	0.332**	0.273**	0.354**
Environmental Concern	0.748*	**0.471**	0.365**	0.370**	0.395**
Personal Norms	0.765*	0.843*	**0.399**	0.323**	0.383**
Willingness to Pay	0.626*	0.849*	0.804*	**0.405**	0.345**
Purchase Intention	0.747*	0.832*	0.876*	0.783*	**0.478**

Note. * = HTMT Ratio, bold = Monotrait Correlations; ** = Heterotrait Correlation.
Source: Prepared by the authors.

Furthermore, the CFA reliability and validity were analyzed by using model fit indices. For χ^2/df (Chi-square/ Degrees of freedom), it should be less than 5; for *p*, the recommended value is <0.05; and for RMSEA, the value should be ≤0.08 (Bagozzi & Yi, 1988; Barnard-Brak et al., 2010; Hu & Bentler, 1999). Meanwhile, the recommended value for GFI, CFI, IFI, TLI, and NFI should be ≥0.90 (Bagozzi & Yi, 1988; Byrne, 2010; Kim et al., 2012).

Here, the following model fit indices were obtained for CFA: χ^2 = 194.871, df = 80, χ^2/df = 2.436, p-value ≤0.001, GFI = 0.913, CFI = 0.944, IFI = 0.945, TLI = 0.927, NFI = 0.910, and RMSEA = 0.067. Thus, all the recommended values were achieved, confirming that the model is reliable and valid. Therefore, to finalize SEM, the proposed conceptual model was analyzed and the respective model fit indices and the standardized regression coefficients for each of the relations were obtained.

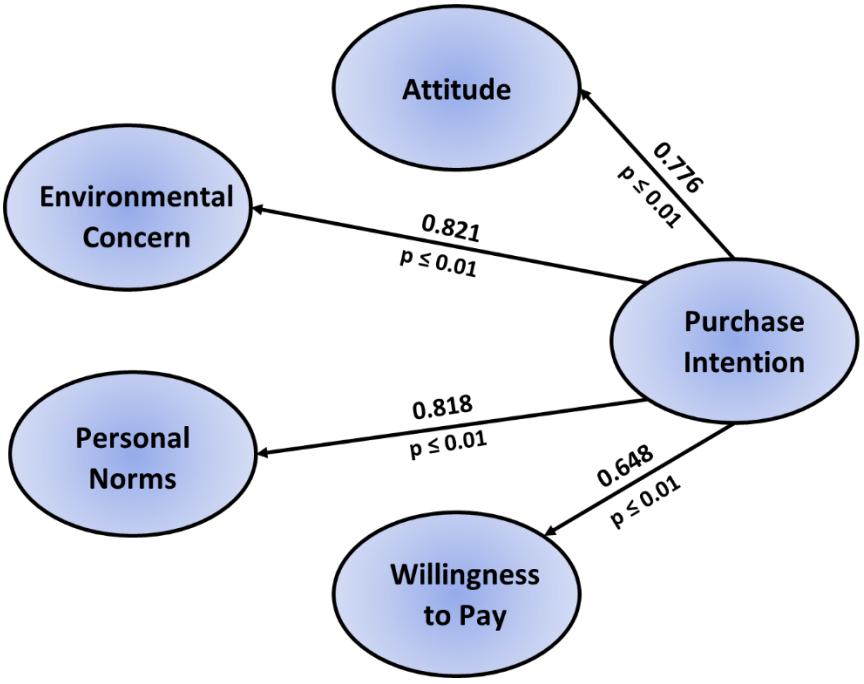
Structural model analysis

The standardized regression coefficients (β values) and the respective p-values of the relationships between the constructs were obtained. The model fit indices were used to test the hypotheses in the proposed conceptual model. All the highlighted parameters can be seen in Figure 2.

The recommended values for the model fit indices χ^2/df, p-value, GFI, CFI, IFI, TLI, and RMSEA were reached. Only the NFI value (0.890) was slightly below the recommended value (≥0.90), but when the other highlighted parameters were considered together, the goodness of fit of the statistical model was confirmed. The β values ranged from 0.648 to 0.821, with Environmental Concern and Personal Norms being the constructs that significantly influenced intention to purchase eco-friendly packaging, followed by Attitude and Willingness to Pay. Therefore, our study hypotheses H_0a, H_0b, H_0c, and H_0d are rejected, and hypotheses H1a, H_1b, H_1c, and H_1d are supported.

Figure 2

Model fit indices of the proposed model and relationship between Purchase Intention and the constructs Attitude, Environmental Concern, Personal Norms, and Willingness to Pay and their respective β values



Model fit indices	
χ2	237.646
df	87
χ2/df	2.73
p-value	<0.001
GFI	0.898
CFI	0.927
IFI	0.927
TLI	0.911
NFI	0.890
RMSEA	0.073

Source: Prepared by the authors.

Discussion

It was observed that the participants were strongly aware of environmental conservation. The constructs Environmental Concern and Personal Norms are the strongest predictors of intention to purchase environmentally friendly packaging among Brazilians surveyed in an influential city in Brazil. In 1960, studies of purchase behavior related to green marketing and green packaging began to appear in the scientific literature. But it was only in 1980, with the rise of eco-labeling, that great interest in the area began to emerge, and several research studies related to the subject were developed. A search of the ScienceDirect platform using the terms “purchase intention” and “green products” shows that 119 articles related to the keywords were published in 1999, whereas 1610 articles were published in 2022. This increasing number of articles per year indicates increasing interest in the subject in view of the environmental deterioration caused by irresponsible and unsustainable consumption of natural resources (ElHaffar et al., 2020; Lavuri et al., 2022; Liobikienė & Bernatonienė, 2017).

Advertising related to sustainable consumption habits and how much people trust a particular brand can affect consumers’ intention to purchase green products. In the current scenario, companies use green marketing campaigns to increase product value and to stand out in the market (Lavuri et al., 2022). Companies must understand consumers’ purchase intention and prepare for the new competitive landscape. In addition, adopting ecological and sustainable packaging is a fundamental step for ensuring the future of the planet.

The question EN4 of the questionnaire “Mankind was created to rule over the rest of nature” in the model was not include because it is not a good item to be applied in Brazil. The possible reason why the question does not reflect the construct “Environmental Concern” may be related to the participants’ religion, especially Christianity, which is the religion with the largest number of practitioners in Brazil (approximately 88% of the Brazilian population according to the most recent Demographic Census; IBGE, 2010). There is the following passage in the bible: “And God said, ‘Let Us make man in Our image, after Our likeness; and let them have dominion over the fish of the sea, and over the fowl of the air, and over the cattle, and over all the earth and over every creeping thing that creepeth upon the earth.’” Genesis 1:26 (Biblegateway, 2023). The highlighted passage expresses the idea that men were made to dominate all animals. The Christian participant who agrees or strongly agrees with EN4 does not necessarily have a different environmental concern than participants that do not agree with EN4. During the interview, participants may have taken religion into account when choosing the answer to EN4, which does not reflect the participants’ opinion regarding Environmental Concern.

Attitude, Environmental Concern, Personal Norms, and Willingness to Pay influence intention to purchase ecological and sustainable products. This study demonstrated a positive relationship between the proposed relationships, and the constructs that impact Purchase Intention the most are Personal Norms and Environmental Concern.

The construct Attitude is an important indicator that can result in ecological and sustainable packaging being purchased. Attitude can impact sustainable consumption habits both positively and negatively. A positive trend was observed for Attitude and intention to purchase ecological and sustainable products (0.776, $p \leq 0.01$). A positive attitude toward consuming environmentally friendly packaging represents a big step toward the development of these products due to incentive and demand for such manufactures (ElHaffar et al., 2020; Salsabila & Salehudin, 2023).

Environmental Concern and Purchase Intention (0.821, $p \leq 0.01$) are strongly, positively correlated. In fact, they lead to the highest correlation among all the studied constructs. A citizen with strong environmental concern is aware of the sustainable development of society and seeks alternatives that harm the environment less. Environmental concern combined with a positive attitude toward protecting the environment can lead to a preference for purchasing more environmentally friendly products (Han et al., 2019).

The construct Personal Norms reflects a moral obligation to protect the environment or responsibility that may or may not result in a particular behavior (Gifford & Nilsson, 2014; Schultz et al., 2016). Personal Norms and Purchase Intention are strongly, positively correlated (0.818, $p \leq 0.01$). The participants are aware of environmental concerns when related to intention of purchasing eco-friendly packaged products. A strong personal norm regarding environment protection can lead individuals to buy products that are sustainable and are better for the environment. Other authors have also reported that Personal Norms greatly influence sustainable consumption habits, as in the case of the hotel sector (Gifford & Nilsson, 2014), reusable packaging (Song et al., 2023), and cars that do not use fossil fuels (Salsabila & Salehudin, 2023).

Willingness to Pay and Purchase Intention are the least related (0.648, $p \leq 0.01$). Most participants are students (59.09%), and most participants' family income is up to 2 minimum wages. Because ecological and sustainable packaging is generally more expensive, consumers with lower family income may choose to purchase the cheapest consumable. In families with high family income, their budget may not be affected by paying a little more for ecological packaging, but for low-income families purchasing products that cost a little more can represent a compromise in family income and even affect food security. Therefore, developing ecological packaging and products with competitive costs can encourage their consumption by all,

regardless of economic income. For a sustainable future to be possible, all citizens must be able to contribute, regardless of economic class (Beck & Pereira, 2012; Cronin et al., 2011; Han, 2021; Popovic et al., 2019).

Regarding comparison to the model and questionnaire proposed by Prakash and Pathak (2017), validated by the researchers in India and used as a basis for the current study, so it can be concluded that that the questionnaire and model is also valid for application in Brazil. Prakash and Pathak (2017) confirmed that intention to purchase ecofriendly packaging is significantly positively influenced by Personal Norms, Attitude, Environmental Concern, and Willingness to Pay. The authors observed that Personal Norms (0.59) and Willingness to Pay (0.44) were the constructs that generated the most significant interactions among all the studied constructs. The authors attributed the result to the fact that young consumers in India are willing to pay a little more for ecofriendly products. Additionally, the strong interaction of Personal Norms reflects a strong ethics and morality regarding environment protection. A strong personal norm with a strong willingness to pay for preserving the environment can result in purchase of green and sustainable products (Prakash & Pathak, 2017).

It was concluded that the Prakash and Pathak (2017) model could be applied in other regions of Brazil and even in other countries, especially in Latin America. However, the cultural and regional aspects of each place where the questionnaire is applied must be considered. As highlighted, it is suggested that question EN4 be analyzed with great care, as countries with a high percentage of Christians may take the religious issue into account when answering the question, which may generate a result that is not consistent with the participant's environmental concern. Understanding consumers' profile with respect to ecological packaging is essential to allow for a sustainable future that respects the planet.

Conclusion

Raising awareness among the population and embracing more sustainable practices concerning disposable plastic materials are crucial for making a more sustainable future possible. The model was validated in Brazil, indicating that the constructs Attitude, Environmental Concern, Personal Norms, and Willingness to Pay influence Brazilians' intention to purchase environmentally friendly packaging. This model can be used in other regions of the country or other Latin American countries to help companies to understand consumers' behavior and to encourage investment in the development of ecofriendly and sustainable packaging that are accessible to the entire population, ensuring sustainable consumption and production patterns and helping to achieve the SDG 12 goals.

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